

POLLEN FLORA OF PAKISTAN -XXII. OXALIDACEAE

ANJUM PERVEEN AND MOHAMMAD QAISER

Department of Botany,
University of Karachi, Karachi - 75270, Pakistan



Abstract

Pollen morphology of 3 species of the genus *Oxalis* L., (Oxalidaceae), from Pakistan has been examined by light and scanning electron microscope. Pollen grains usually radially symmetrical, isopolar or apolar, prolate-subprolate, rarely oblate - spheroidal, colpate. Sexine thinner or thicker than nexine. Tectum reticulate. On the basis of pollen shape, 2 distinct pollen types viz., *Oxalis corniculata* - type and *Oxalis pescaprae* - type are recognized.

Introduction

Oxalidaceae is mainly tropical and subtropical family comprising of 3 genera and 575 species (Willis, 1973; Mabberley, 1987). In Pakistan it is represented by a single genus *Oxalis* L., with 4 species (Nasir, 1971).

Pargney (1978) examined the pollen of *Oxalis corniculata* L., while studying the anatomy of the species. Similarly, Banerjee & Barghoorn (1970) examined the exine structure of *Oxalis rosea* by scanning and transmission microscopy. Qaiser & Perveen (1997) provided some palynological information of the family Oxalidaceae while studying pollen flora of Pakistan. Pollen morphology of the family has also been studied by Erdtman (1952); Faegri & Iversen (1964); Kuprianova & Alyoshina (1972), Oltmann (1972), Praglowski & Punt (1973), Rowley & Skvarla (1976), Moore & Webb (1978). There is no comprehensive report on the pollen morphology of the family Oxalidaceae from Pakistan. Present investigation is based on the pollen morphology of 3 species of the family Oxalidaceae by light and scanning electron microscope.

Materials and Methods

Pollen samples were obtained from Karachi University Herbarium (KUH) or collected from the field. The list of voucher specimens is deposited in KUH. The pollen grains were prepared for light (LM) and scanning microscopy (SEM) by the standard methods described by Erdtman (1952). For light microscopy, the pollen grains were mounted in unstained glycerine jelly and observations were made with a Nikon Type-2 microscope under (E40, 0.65) and oil immersion (E100, 1.25), using 10x eye piece. For SEM studies, pollen grains suspended in a drop of water were directly transferred with a fine pipette to a metallic stub using double sided cellotape and coated with gold in a sputtering chamber (Ion-sputter JFC-1100). Coating was restricted to 150A. The S.E.M examination was carried out on a Jeol microscope JSM-T200. The measurements are based on 15-20 readings from each specimen. Pollen diameter, polar axis (P) and equatorial diameter (E), aperture size, apocolpium, mesocolpium and exine thickness were measured (Table 1).

The terminology used is in accordance with Erdtman (1952), Faegri & Iversen (1964), Kremp (1965) and Walker & Doyle (1976).

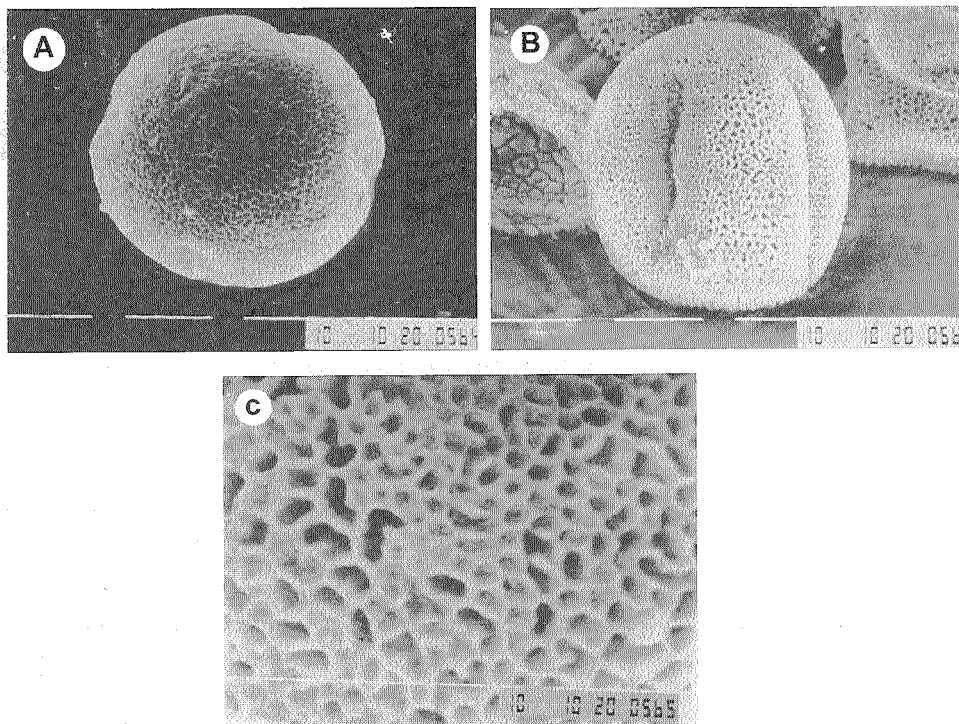


Fig. 1. Scanning Electron micrographs of pollen grains.
Oxalis corniculata: A, polar view; B, Equatorial view; C, Exine pattern.
 Scale bar = A - E, = 10; F = 1 μ m.

General pollen characters of the family Oxalidaceae

Pollen grains usually radially symmetrical, isopolar, prolate-subprolate, rarely oblate-spheroidal, tricolpate or pantacolpate, sexine thinner or thicker than nexine. Tectum reticulate. On the basis of pollen shape 2 distinct pollen types are recognized viz., *Oxalis corniculata* - type and *Oxalis pescaprae* - type.

Key to the pollen types

- + Pollen oblate-spheroidal *Oxalis corniculata* - type
- Pollen grains prolate or sub-prolate *Oxalis pescaprae* - type

Descriptions of the pollen types

Pollen type-I: *Oxalis corniculata* (Fig.1 A-C).

Pollen class: Tetracolpate and pantacolpate.

P/E ratio: Sub-transverse.

Shape: Oblate - spheroidal.

Apertures: Ectoaperture-colpi long narrow, intruding with rounded ends. Colpal membrane sparsely granulated.

Exine: Sexine thinner than nexine.

Ornamentation: Tectum coarsely reticulate, lumina 0.5-1.64 μm in diameter, variable in size and shape.

Measurements: Polar axis P(28.72-) 35.57 ± 0.61 (-37.69) μm , and equatorial diameter E(35.9) 37.33 ± 0.48 (-39.49) μm , P/E ratio: 0.95. Colpi (17.95-) 21.18 ± 0.35 (-21.54) μm long. Mesocolpium (17.95-) 21.30 ± 0.39 (-21.54) μm . Exine (1.07-) 1.52 ± 0.11 (-1.75) μm thick. P.A.I: 0.48

Species included: *Oxalis corniculata* L.

Pollen type-II: *Oxalis pescaprae*

Pollen class: Tricolpate or pantacolpate.

P/E ratio: Erect to semi-erect.

Shape: Prolate to sub-prolate.

Apertures: Ectoaperture - colpi long narrow, intruding. Colpal membrane subpsilate.

Exine: Sexine thicker or thinner than nexine.

Ornamentation: Tectum medium reticulate, with \pm regular pattern of muri, lumina 0.16- 0.83 μm in diameter \pm circular in shape.

Measurements: Polar axis P(31.5-) 45.68 ± 1.47 (-52.5) μm , and equatorial diameter E(20-) 33.6 ± 0.75 (-35.25) μm . P/E: 1.30-1.35. Colpi (25.51-) 39.68 ± 0.99 (-45) μm long. Mesocolpium (22.5-) 26.94 ± 1.36 (-35) μm . Apocolpium (1.25-) 3.19 ± 0.62 (-5) μm . Exine (2.5-) 2.53 ± 0.89 (-2.75) μm thick.

Species included: *Oxalis pescaprae* L., *Oxalis latifolia* Kunth

Key to the species

- + Pollen grains prolate *Oxalis pescaprae*
- Pollen sub-prolate *Oxalis latifolia*

Discussion

Oxalidaceae is a stenopalynous family. It is fairly uniform in its pollen morphology. Pollen grains are generally prolate to sub-prolate, rarely oblate-spheroidal, tricolpate rarely pantocolpate with reticulate tectum. On the basis of pollen shape 2 distinct pollen types are recognized viz., *Oxalis corniculata* - type and *Oxalis pescaprae* - type. The *Oxalis corniculata* - type is characterized by its oblate-spheroidal shape pollen with reticulate tectum, while the *Oxalis pescaprae* - type is readily distinguished by its prolate to sub-prolate pollen. In this pollen type 2 species are included. However, these species are similar in pollen shape but there is little variation in their equatorial diameter which is significant at the specific level. In *Oxalis latifolia*, pollen grains 20-28.75 μm in diameter, while in *O. pescaprae* pollen grains are 30-35.25 μm in diameter (See key to the species).

The pollen grains of closely related family i.e., Linaceae are more or less similar to Oxalidaceae as both the families have colpate pollen. However, in the family Linaceae tectum is baculate (Erdtman, 1952).

Acknowledgement

We are thankful to the National Scientific Research Development Board (NSRDB), University Grants Commission Pakistan for providing financial support. We are also grateful to the Director of Biological Research Centre for providing facilities of scanning electron microscope.

References

- Banerjee, U.C. and E.S. Barghoorn. 1970. Scanning and transmission electron microscopy of exine pattern in normal and aborted pollen grains and the structure of Ubisch bodies and tapetal membranes in *Oxalis resea*. *Amer. J. Bot.*, 57(6:2): 741.
- Erdtman, G. 1952. *Pollen Morphology and Plant Taxonomy. Angiosperms*. Chronica Botanica Co., Waltham, Massachusetts.
- Faegri, K. and J. Iversen. 1964. *Textbook of Pollen Analysis*. Munksgaard, Copenhagen.
- Kremp, G.O.W. 1965. *Encyclopaedia of Pollen Morphology*, Univ. Arizona Press, Tuscon, U.S.A.
- Kuprianova, L. and A. Alyoshina. 1972. Pollen and spores of plants from the flora of European part of USSR. Vol. I. Acad. Sci. U. S. S. R. Komarov. *Bot. Inst.*, 170.
- Mabberley, D.I. 1987. *The Plant Book*. Camb. Univ. Press, Cambridge, New York.
- Moore, P.D. and J.A. Webb. 1978. *An Illustrated Guide to Pollen Analysis*. Hodder and Stoughton, London.
- Nasir, Y. 1971. Oxalidaceae. In: *Flora of Pakistan*. 4: 1-7 (Eds.): E. Nasir and S.I. Ali. Rawalpindi.
- Oltmann, O. 1972. Pollenbau, Chromosomenzahlen und geographische Verbreitung innerhalb der Oxalidaceae. Naturwissenschaft. *Rundschau, Stuttgart*, 25(4):139-142.
- Pargney, J.C. 1978. Etude ultrastructurale de la gameotogenese male dans une espece a floraison Cleistocleistogame: *Oxalis corniculata*, suivie de quelques considerations generales sur la Cleistogamie. *Can. J. Bot.*, 56: 1262-1269.
- Praglowksi, J. and W. Punt. 1973. An elucidation of the microreticulate structure of the exine. *Grana*, 13: 45-50.
- Qaiser, M. and A. Perveen. 1997. A Palynological Survey of Flora of Pakistan. In: *Proceedings of Int. Symp. on Plant Life of S. West Asia and Central Asia*, (Eds.): M. Ozturk, O. Secmen & G. Gork. pp. 795-835.
- Rowley, J. and J.J. Skvarla. 1976. Surface coating of germinal apertures of pollen and evolution of apertures. *34th Ann. Proc. Electron Microscopy Soc Amer.*, 42-43.
- Walker, J.W. and J.A. Doyle. 1976. The basis of Angiosperm phylogeny: Palynology. *Ann Mo Bot Gard* 62: 666-723.
- Willis, J.C. 1973. *A Dictionary of the flowering Plants and Ferns*. VII ed. University press, Cambridge.

(Received for publication 30 December 2002)